K26 Determination of Drug Distribution in Postmortem Tissues and Bones of Pigs Administered Drugs

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After attending this presentation, attendees will better understand whether organ and bone samples collected from decomposed and buried corpses at different postmortem intervals are useful for predicting the blood concentration of drugs.

This presentation will impact the forensic science community by clarifying that analyses on body tissues and interpretation of results after decomposition and exhumation are challenging tasks. This presentation will add to research being conducted regarding how the concentration of drugs change during burial time and exhumation and how this concentration may depend on the type of bone.

Forensic toxicological analyses may provide significant information in determining the cause of death or in *explaining forensic cases*. Traditionally, body fluids such as blood and urine are investigated in cases of intoxication and poisoning-related deaths; however, these samples are often no longer available for forensic toxicological analysis in decomposed and skeletonized corpses due to autolysis/putrefaction after burial and, possibly, time since death.[1,2] Substrates in postmortem toxicology are often seriously influenced by postmortem degradation, redistribution, matrix effects, temperature, etc. Therefore, interpretation of the results may be difficult.[3] In such cases, bones and visceral tissues that preserve structural integrity may be useful as alternative samples for toxicological analysis of toxic and drug poisoning cases.[4-6]

The goal of this experiment was to quantify drugs in putrefied/decomposed visceral tissues and buried bones and to determine the effect of burial on levels and distribution of drugs in tissues and bones collected from domestic pigs. Five *Sus scrofa domestica* pigs were used as research subjects. The experiment was conducted at the Experimental Research and Application Center of Medical Sciences in Cukurova University, Adana, Turkey. Drugs selected from various drug classes were divided into groups and administered to domestic pigs. The concentration of drugs was prepared to achieve an expected toxic level (for humans). Drugs were administrated to each pig, including a negative control, (n=4+1) respectively from pills (capsules and tablets), by gastrointestinal administration, and from solutions by intravenous administration. Peripheral blood, liver, cardiac muscle, spleen, kidney, brain, and bone samples from different anatomical locations (scapulae, humerus, and ulna from the upper extremity; cervical vertebrae, thoracal vertebrae, lumbar vertebrae, and rib from the thorax; ilium, femur, tibia, and fibula from the lower extremity) were collected from the pigs. The pigs were sacrificed four hours after administering propofol in order to allow for distribution and absorption of drugs. After organ samples were collected at 24, 48, 72, and 96 hours postmortem, bone samples were exhumed from corpses buried below soil ground at five and ten months. All samples were extracted using appropriate methods and analyzed by LC/MS/MS.

Only 9 of the 14 drugs were detected in the initial peripheral blood draw. A possible explanation why fentanyl, sertraline, tramadol, and zopiclone were not detected in initial blood draws may be the relatively small amounts that were administered, compared to the other drugs. According to this result, the drug levels in tissues were higher than in initial blood. For all bone types analyzed, the highest drug levels were detected from the thorax region and the lowest drug levels were detected from the lower extremities. Whereas the concentration of venlafaxine in fresh tibia was 0.94µg/g, it was 30.4µg/g in fresh ribs. It was observed that soft tissues liquefied when exhumation occurred at five months. Drug levels in bones collected at the fifth month increased. Whereas the concentration of venlafaxine in the tibia collected at the fifth month was 33.9µg/g, it was 94.3µg/g in the ribs. Given the fact that most of the soft tissue is located in the thorax region, it is possible that during the decomposition process, drugs partitioned from the liquefied tissue into bones. Drug levels detected in bones collected at the tenth month decreased.

These data demonstrated that drug levels in organ and bone samples collected from decomposed and buried corpses at different time intervals vary due to unknown mechanisms below ground where the corpse is exposed to the soil and completely unexplained conditions such as postmortem redistribution. These samples, collected under conditions in which blood is not appropriate for forensic toxicological analysis, are not uniformly useful for predicting blood concentration of drugs.

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Bone Analysis, Drugs Analysis, Exhumation